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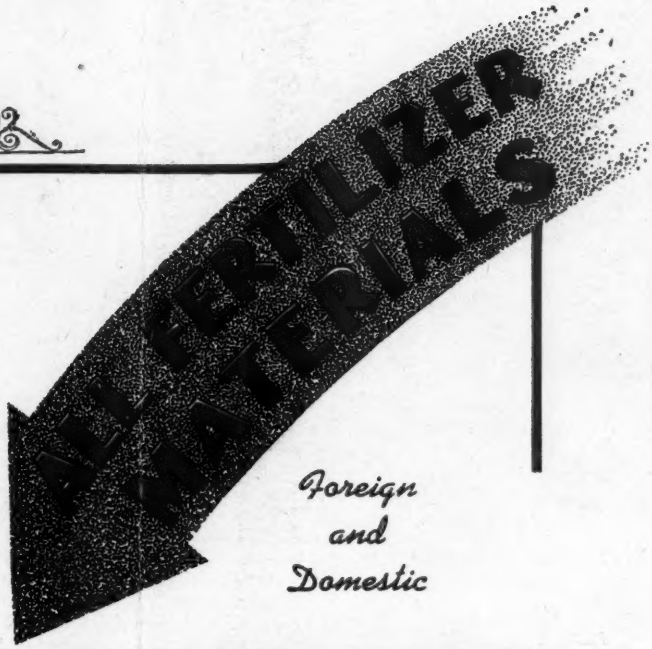

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See page 27

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Vol. 101 DECEMBER 2, 1944 No. 11

Boron in Agriculture*

By E. M. Kitchen

Pacific Coast Borax Company, New York, N. Y.

TWO years ago, when a paper was presented on the same subject, there were 34 crops that had shown responses to borax application. Now, it is reported there are 44 crops that need boron inclusions for proper nutrition.

A request was made that some discussion be directed toward the sensitivity of various crops to borax applications. There has not been much work along this line with the exception of that done by Purvis (*4*)†. He classed vegetable plants under four groups: "very sensitive," "sensitive," "tolerant," and "very tolerant." In the "very sensitive" group was included cowpeas, cucumbers, snap beans, and strawberries. These plants could not stand over five pounds of borax per acre. The "sensitive" group, which received up to 20 pounds of borax per acre, was celery, muskmelon, peas, potatoes, squash, and watermelon. The "tolerant," or 30 pounds of borax per acre group, was the largest, containing cabbage, carrots, collards, corn, eggplant, kale, lettuce, lima beans, okra, onions, pepper, radish, spinach and sweet potatoes. The "very tolerant" group had an application of borax up to 50 pounds per acre and was beets, cauliflower, mustard, tomatoes, and turnips. Mangels and alfalfa also fall in this last group. This later crop has received 100 pounds of borax per acre with no toxicity symptoms. It is not recommended, however, that over 20 to 25 pounds of borax per acre be applied at time of seeding. An established stand of alfalfa will generally take from 15 to 40 pounds of borax per acre to correct boron deficiency symptoms. Sometimes 25 pounds of borax per acre at time of seeding will not suffice to control yellowing. One field in Massachusetts received this application when the field was seeded last August. This May, a 30-pound acre strip was run across the field. In the middle of June the only green area was the re-treated one. This meant that 55 pounds of borax had been required over a nine-month period. This was not too much borax as scattered yellow plants were found in the re-treated area. In the case of some of the previously mentioned crops the number of pounds of borax that may cause toxicity can vary due to soil, climatic conditions, etc. In tests this year it was found that rhubarb and parsnips showed no toxic effects when side-dressed with borax at the rate of 20 pounds per acre. Rhubarb seemed to exhibit a heavier growth with darker green leaves but the observation was made early in the season.

Borax on Table Beets

An interesting development of recent date has been the spraying of borax solution on table beets in Wisconsin, and rutabagas in Ontario. Soil applications have not been very successful due to high lime conditions in the soil. MacLachlan (*3*) has been conducting a series of borax spray tests on this crop for the past four years. The results are most satisfactory from the disease control standpoint and also from the economy angle. Soil applications as high as 100 and 200 pounds of borax per acre failed to give 100 per cent control of the water core while one and two sprays of a 2 per cent borax solution, 8 pounds of borax to 40 gallons of water, gave practically complete control. Forty gallons of spray is

* Presented before the Division of Fertilizer Chemistry, American Chemical Society, New York, September, 1944.

† Numbers in parentheses refer to literature cited at the end of the paper.

sufficient to cover one acre. The spraying is simplified since only the upper surface of the leaves need to be covered in order to control boron deficiency. Applications should be made when the roots of the turnips are from one to one and a half inches in diameter but not more than two inches. If the occurrence of water core is not severe, one spray may be sufficient, but if check rows show a few roots that are diseased, two spray applications are necessary. The second spray is generally applied one month after the first one.

Other Beet Experiments

Walker, Schroeder, and Kuntz (*5*) observed that black spot showed up in garden beets which had received borax at the rate of 75 pounds per acre. This was noticed during periods of drought and immediately following such periods when ample rain accelerated growth. Walker believes the boron is rendered unavailable to the plant during these dry spells. When the rapid growth takes place, there is probably not enough boron in solution to satisfy the plant's needs and consequently deficiency symptoms appear. It was Walker's thought that if a spray could be applied at the time the beets needed ample boron, the black spot might be materially reduced. In order to check this, two sprays, July 8th and August 7th, of ten pounds of borax each per acre were applied. The black spot was reduced significantly over the check. Two sprays of 20 pounds of borax each per acre were also applied on the same dates with similar results. One spray of 20 pounds of borax per acre applied on July 8th gave very good control of black spot. Another field that received a 20-pound spray on August 7th showed very little control. All these spray tests were on fields that had received 75 pounds of borax per acre as a soil application. Walker does not know if sprays could entirely replace the soil application but he learned that they could materially reduce black spot when used in conjunction with soil applications.

Borax in Pasture Fertilizers

During recent years much emphasis has been placed on pastures. The use of fertilizer has increased greatly and has shown a profitable return in nearly every case. The eleven southern States, according to Hendricks (*1*), have increased their lime applications 200 per cent and their fertilizer use 100 per cent in the years 1936–1942. Borax has been found to have a place in the pasture fertilization program according to Killinger and associates (*2*). They observed marked responses in pastures that received the minor elements in addition to ordinary fertilizer materials. California Bur clover showed a noticeable response to borax just prior to blooming. The deficiency symptoms on this clover were observed as a dwarfing of the plant and distortion of the apex leaves. Seed set was not satisfactory and many blooms aborted. White Dutch clover did not respond during the early growth stages but gave increased late season growth when treated with borax. This clover, on the borax treated plots, survived the high summer temperatures better than the plants in the check plots. Survival of the clover improved the quality of the feed and may be expected to furnish earlier winter and spring grazing in the following season.

The response of grasses to borax was secondary to responses from some of the other elements. Grasses do not seem to require as much boron as to the legumes. However, Killinger (*2*) suggests the use of 5 to 10 pounds of borax per acre for grasses and the same amount per acre for clovers.

Virginia Pasture Tests

Pastures in Virginia, which received borax at the rate of 20 and 25 pounds per acre, showed a heavy growth of white Dutch clover where little had been before. More work is being done on this to check the results further. Another test, which is to be followed by more work, was on orchard grass. The application of 40 pounds of borax per acre raised a poor field to the point where it was as good as the best field on the farm. The grass was raised for seed and the set was every heavy on the treated area. Other pasture tests in other areas were not able to be used for results because of drought conditions existing during the summer. It is possible that results will be obtained this fall if the tests follow out the Florida observations as to fall responses.

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Industry Advisory Committee Meets

Shortage of Superphosphate and Fertilizer Nitrogen Discussed. Potash Allocation System May be Discontinued. Early Delivery of Fertilizers Urged. Price Control to Continue.

THE WFA Fertilizer Industry Advisory Committee met at Washington on November 15th, P. H. Groggins, WFA, presiding. Also present: J. E. Barnes (for H. M. Albright), H. B. Baylor (for Franklin Farley), George Cushman, Ralph B. Douglass, George W. Gage, S. B. Haskell, M. H. Lockwood, M. H. McCord (for C. F. Hockley), John A. Miller, John L. Morris (for Wm. B. Tilghman, Jr.), Weller Noble, Walter S. Rupp, John E. Sanford, C. D. Shallenberger, Nelson T. White, F. J. Woods, J. A. Woods, members of the Committee; Charles J. Brand, Richard Bradfield, R. W. Cummings, F. W. Darner, Leon H. Davis, Clarence Dorman, A. F. Miller, D. S. Murph, J. W. Turrentine, by invitation; G. R. Carson, T. L. Jefferies, C. L. Long, L. G. Porter, G. M. Worman, Fertilizers Division, WFA, U. S. D. A.; D. W. Aitken, A. E. Burns, W. G. Finn, O. S. Fisher, A. C. Howard, F. B. Northrup, F. W. Parker, J. H. Stallings, Capt. J. H. Stambaugh, A. G. Taylor, W. F. Watkins, other U. S. D. A.; S. L. Clement, Dale C. Kieffer, William Lehmann, H. L. Taylor, WPB; J. C. Freeman, Cedric G. Gran, OPA.

F. B. Northrup, new director of the Office of Materials and Facilities, was presented. He stated that he was looking forward to an early V-E Day and relinquishing of government controls of business but said there might be need for continuing some controls for a limited time.

Potash

WPB reported that indications continue to point to 725,000 tons of K_2O as available for domestic agriculture during 1944-45. This figure compares with 605,000 tons last year. Present accumulations of potash at producing plants represent 20 to 25 days' production. WPB officials are doing all they can to get cars for use in making delivery. Attention was directed to the letter sent to fertilizer manufacturers on November 7th regarding the plan for conversion of muriate of potash to sulphate of potash. WPB is giving consideration to its potash controls. Presently the thinking is in the direction of removing all such controls as of January 1st, though this action is not assured. In any event it is not probable that allocations to individual fertilizer manufacturers will be continued after January 1st. The matter is to be presented to the WPB Potash Industry Advisory Committee for consideration. The WFA Advisory Committee expressed approval of the removal of controls if this course is approved by the WPB Potash Committee.

Superphosphate

The subcommittee and WPB reported on the superphosphate situation. Sulphuric acid is being taken from superphosphate for other uses. Production of superphosphate during the first quarter (July-August-September) of the 1944-45 fertilizer year was accordingly disappointing. On the assumption that production for the next 9 months will be at the same relative rate as during the first quarter, production of superphosphate for the entire year would be less than last year's production by approximately 1,150,000 tons (18 per cent basis)—1,000,000 tons normal, and triple superphosphate the equivalent of 150,000 tons. WPB thought that some degree of relief might be apparent by the first of January, through the coming into operation of some new acid plants and through the release by Ordnance of spent acid.

AAA has bought between 400,000 and 500,000 tons of superphosphate for the first half of the year and has invited bids for the second half.

Some members of the committee felt that the present trend in production, if continued, might result in a shortage of superphosphate for making mixed fertilizers and that the quantity of mixed fertilizers produced this year might be less than the quantity produced last year. WPB stated that if sulphuric acid should be put under allocation, the allocation would be at the producer level and would not extend to individual manufacturers of superphosphate.

The committee accepted the report of the subcommittee, which included an expression of the hope that allocation of sulphuric acid would not be necessary but

that if it should become necessary full consideration would be given to the essentiality of the production of superphosphate so that sufficient sulphuric acid will be obtainable in time for the full production of superphosphate necessary for the requirements of spring, 1945, fertilizers, which requirements are expected to be as large as or larger than spring, 1944.

Chemical Nitrogen

WPB reported that changing military requirements have reduced the estimated quantity of chemical nitrogen available for fertilizers during 1944-45 by more than 100,000 tons of nitrogen as compared with the July 1st estimate. Solutions were available for fertilizer for November in about the same quantity as for October, and the December prospects are expected to be about the same amount. There is a possibility that all solutions will be withdrawn from fertilizers in January or February. Ordnance took some grained ammonium nitrate from TVA in November and is scheduled to continue taking in December, January, and February, though recent advices are that the December production will not be required by Ordnance. No TVA ammonium nitrate may be available for fertilizer after February. This would leave Canada as the only ammonium nitrate source for the Southeast.

Because the War Department's plans are subject to change, WPB cannot estimate with any great degree of certainty the amount of chemical nitrogen that will be available for fertilizer during 1944-45. It was pointed out that inventories in the hands of fertilizer manufacturers on July 1, 1944, were about 22,000 tons more of nitrogen than such inventories on July 1, 1943. Including this inventory excess, WPB made a rough guess that there might be available 600,000 to 610,000 tons of nitrogen as compared with last year's consumption of 631,000 tons. This guess, it was pointed out, is subject to instant change. Though the difference from last year is not so great in terms of total nitrogen, a shortage will be felt in nitrogen for mixed fertilizers because most of the loss is in ammonium nitrate and solutions, while there will be an increase in imports of nitrate of soda from Chile.

Organic Nitrogen

It was reported that production of organic nitrogen is proceeding approximately on schedule. WFA reported that 102 authorizations for the acquisition of 40,000 tons of edible oilseed meals had been issued under WFO 105. WFA received from applicants requests for delivery of 5,645 tons of "set-aside" meal during November, but Certificates of Designated Buyer were issued for only about 500 tons by the Feed Management Branch, Office of Production, WFA. These results indicate that fertilizer manufacturers should not rely on "set-aside" meals as a source of supply but should make every effort to locate supplies in the open market.

WPB Nitrogen Control Orders

Several weeks ago WPB advised a meeting of its Superphosphate Producers Advisory Committee that allocation controls might be removed from potash and nitrogen before January 1st. That Committee recommended that allocation controls be maintained on nitrogen and potash to assure a balanced supply to industry with the addition, however, that if WPB controls are removed the chemicals should be completely freed from governmental restrictions.

The mixed fertilizer subcommittee of the WFA Fertilizer Industry Advisory Committee at its meeting on November 14th considered the proposed change in WPB allocation procedure and reported to the Committee on the 15th that on account of certain provisions in the Reconversion Act (approved October 3rd) and the war veteran directive, WPB is "planning to terminate the present allocation procedure as of January 1, and to provide for allocation by uses to producers of raw materials by periods. The producer will then have the responsibility of making equitable distribution to his customers and WPB will still have power to issue directives to relieve difficult situations." The subcommittee, feeling that it is desirable to remove Federal regulations and controls just as soon as they are unnecessary, made no specific recommendation on the subject.

The Committee discussion indicated that most or all of the members felt that if nitrogen control is to be continued the present orders are preferable to the proposed allocation by uses to producers of raw materials by periods, which would not include any allocation to fertilizer manufacturers as users of nitrogenous materials.

Mr. Kieffer commented on the provisions of the Reconversion Act and the war veteral directive, under which in expansion,

(Continued on page 24)

New OPA Fertilizer Regulations

Effective November 28, 1944, new regulations affecting the retail sale of mixed fertilizers and fertilizer materials, were issued by the Office of Price Administration as a second revision of MPR 135. This revised regulation now covers not only the sales of mixed fertilizers, superphosphate and potash, as in the past, but nitrogenous fertilizer materials, superseding Revised Maximum Price Regulation 108 covering nitrogenous materials.

The Order states, concerning changes made: "So far as practicable the Price Administrator has advised and consulted with representative members of the industry affected by these regulations."

Members of the fertilizer industry receiving copies of the revised regulation will find changes made in paragraphs of the older regulations underscored.

Coverage Expanded.—All sales to consumers and dealers of domestic or imported mixed fertilizers, superphosphate, potash and nitrogenous materials, are covered by the amended regulations. Dealers in fertilizer materials are to include "the resale of fertilizers by a landlord to his tenant." As indicated above, nitrogenous materials are included.

New Grades.—The new regulation says: "If the product was not generally sold during March, 1942, the margin shall be the same as that established for the most nearly comparable product which was sold during March, 1942."

Delivery Prices.—Clarification of f. o. b. and delivery prices is contained in the following general statement:

"In any schedule of Appendix A which establishes prices on a delivered basis but which also provides a method for establishing a maximum price for sales f. o. b. the seller's place of business, the f. o. b. price plus the actual transportation cost must not exceed the delivered price as specified in the applicable schedule. This shall not apply in the case of a consumer taking delivery in his own truck or arranging for the transportation on his own account."

Specific statements on deliveries are mentioned after each of the regional schedules.

Official Explanations

A statement by Administrator Chester Bowles explains reasons for the changes. This statement appended to the published order, is as follows:

"On July 26, 1944, a completely revised draft of MPR 135, applicable to retail prices of fertilizers, was issued. That revision did not change the general level of maximum prices for fertilizers but did involve certain changes in the method of control. The delivery provisions for many of the price zones were reworded to promote clarity. The regulation was expanded to cover nitrogenous fertilizer materials which had been priced under another regulation. In addition, following the issuance of that revision, much of the authority for administering it which had previously been retained by the National Office was delegated to the appropriate Field Offices of the Office of Price Administration.

"In connection with the decentralization of responsibility for administration of the regulation representatives of the National Office contacted the Regional and District Offices to explain the background of the regulation and to discuss its more technical features. As a result of those contacts, many minor points are being modified in this amendment for greater clarity and ease of enforcement. Some of the changes also are being made in accordance with the recommendations of the Fertilizer Industry Advisory Committee and other qualified industry representatives.

"The most significant feature of this amendment is the addition of a clause in Section 9 to the effect that fertilizer sales to dealers are also covered by the regulation. Without that clause, sales to dealers automatically reverted to the controls of the General Maximum Price Regulation which, in some areas where price relief had been granted since the spring of 1942, resulted in unintentional hardship upon those manufacturers marketing through dealers. The price to dealers may now be determined by deducting from the consumer price the established or customary dealer's discount. That provision merely establishes

the maximum price to dealers. Any manufacturer desiring to increase his allowance to dealers may do so by selling to dealers at less than the ceiling price.

"The term 'dealer' has been clarified with respect to sales by landlords to tenants. A landlord may not sell fertilizer to his tenant at a higher price than the maximum specified in the appropriate schedule of the regulation.

"This amendment corrects any misunderstanding there might have been in the industry with respect to the delivery provisions of the regulation. Some schedules, such as G, H, and Q, were drafted so that the base price included delivery to the buyer's premises because that had been the most common method of pricing in the area prior to the war. Those schedules also carried a provision for f. o. b. factory sales, which some sellers considered a loophole for evasion of the regulation.

"A new paragraph in the 'general provisions' section of Appendix A clearly explains that the f. o. b. factory price may not be used if the seller performs or arranges for delivery to the farm and if the resulting delivered price thereby exceeds the delivered price specified in the regulation. Such an evasive practice tended to raise the price of fertilizer to consumers and did not comply with the intent of the regulation.

"In the Baltimore area of Schedule G, delivered prices are adjusted to restore customary delivery differentials in that area. The July 26 revision of MPR 135 inadvertently had reduced the charge sellers could make for delivery from Baltimore.

"In Schedules A to F inclusive and Schedules M and N the provision for price deduction for nitrogenous materials shipped direct from production point to consumer is clarified to apply to car-door pickups by the consumer but not to materials handled through the warehouse or a dealer or agent.

"In Schedule O the delivery terms are changed to make it clear that the base price includes delivery to the local distribution point—either the agent's or dealer's warehouse or the railsiding at which the consumer would customarily accept delivery.

"The zone lines in California are modified slightly to avoid dual prices in local consuming areas which cannot be divided in a practical manner.

"Since the issuance of the revised regulation in July, several new grades have been priced upon application to the National Office. In most instances the new grade is a multiple or high-analysis grade of the same plant-food ratio as a grade priced in the regulation. Because the price per unit of plant food is lower in the high-analysis grade and because those grades conserve shipping and storage space and the labor of handling, the Office of Price Administration is pleased to add to the regulation the maximum prices for those new grades.

"The provision for pricing specialty fertilizers is modified eliminating the fixed dealer margin of 40 per cent and permitting a seller with no historical price basis to adopt the dealer discount policy of his most closely competitive seller. In addition a provision has been added requiring new sellers of uncommon types of specialty fertilizers to apply to the National Office for approval of a maximum price.

"In the judgment of the Price Administrator the changes in this amendment are generally fair and equitable, will effectuate the purposes of the Emergency Price Control Act of 1942 as amended, and the Stabilization Act of 1942, as amended, and are in accord with Executive Orders 9250 and 9328."

DDT for Agricultural Uses Deferred

The wonders of the new insecticide DDT have been so widely publicized, that there will be widespread disappointment when it is made known that it will not be immediately released for agricultural use. But WPB has told producers that military requirements for DDT are increasing and that such as can be spared will be allocated for experimental uses.

Experimentation is designed to answer the question of toxicity of the material and what tolerances will be allowed for its presence on food and feed. Several months, it is claimed, will be required to carry out the tests.

Lime-Gypsum Prices

In selling to each other, producers of lime or gypsum have permission of OPA to charge above the ceiling price in effect previous to November 1, 1944. Both the buyer and seller must be producers and the buyer must sell in the same form as purchased, but at the ceiling price fixed for the customer. In other words, the producer-buyer cannot pass on to the consumer any increase he has had to pay but must absorb the loss.

IT MAY BE

By SAMUEL L. VEITCH

Dumbarton Oaks Conference

The Dumbarton Oaks Conference has pretty well agreed upon the general proposition that the new world organization is to have the power to use force, if necessary, to prevent nations from threatening the peace. It now looks as though three decisions would have to be made by the United States, and that each one of them would be made separately. One reason why the League of Nations was rejected was that all three of three somewhat similar decisions came before the Senate at one swoop.

The first is the question of how we should join the United Nations. That decision will probably be made by the Senate with two-thirds vote required for approval in accordance with the present constitutional provision for ratification for treaties.

Next comes the question of ratifying the special agreement, designating what United States forces and facilities may be used when security commission orders military action. That decision will probably be made by both Houses of Congress with the requirement of a majority vote of each House, plus the signature of the President.

The third question is the agreement on the actual terms of peace. This latter may be the last one to be decided, because it is entirely possible that the United Nations Charter will be ratified before peace terms are settled.

Secretary of Commerce

There has been much talk about Jesse Jones standing so close to the Texas fire that he got singed, and is on the way out, and Wallace wants the job. The picture may not be exactly true, it is very possible Wallace will not get the call as Jones will probably still be Secretary of Commerce when the smoke clears away.

Situation in China

The situation in China at present is not exactly a bed of roses. Aside from a lot of "dirty work at the crossroads" such as graft and misdirected war materials, there are other reasons for concern. Madame Chiang Kai-shek's visit to this country was not purely for medical reasons. It is a long story and rather shocking.

Did You Know?

In 1800 the population had increased over 1790 by 35 per cent. In 1850 it had increased over 1840 by 6 per cent. Then something happened. The percentage of increase from decade to decade started down and has been declining ever since. In 1930 the increase was only 16 per cent over 1920. Students of natural growth and of future trends point to this fact and say we have grown up, have become mature and that the days of expansion are over. Yet the period from 1900 to 1930 when the population growth declined, we enjoyed our greatest industrial expansion. In 1900, farm income was greater than industrial income. There were but one million telephones, only 4 thousand motor cars were produced that year, only 300 thousand homes were wired for electricity, we produced only 43 million barrels of oil, 12 million tons of steel, and 35 million pounds of aluminum. As a comparative figure in 1943, steel production reached 90 million tons. War has proved how a nation's industrial output can be doubled. Is there any gloomy reason why the resourcefulness and genius of this country cannot achieve in the next forty years what it achieved in the past forty?

And along that line, the railroads of the country will begin a gigantic rebuilding and equipment program soon after the war ends in Europe. If present plans are carried out, many thousands of miles of new and heavier track will be laid to replace that worn out by wartime traffic. Revolutionary changes will come in postwar passenger traffic and accommodations, for new light-weight cars are in the blueprint stage waiting for manufacturing facilities to become available. Passenger fares are expected to be reduced to meet the automobile and air traffic competition. Light-weight roller-bearing freight cars are on the way. Diesel-electric engines will rapidly replace much of the present steam equipment. Electrification of long sections of trackage is also expected.

THE AMERICAN FERTILIZER
ESTABLISHED 1894
PUBLISHED EVERY OTHER SATURDAY BY
WARE BROS. COMPANY
1330 VINE STREET, PHILADELPHIA, PA.

A Magazine international in scope and circulation devoted exclusively to the Commercial Fertilizer Industry and its Allied Industries

PIONEER JOURNAL OF THE FERTILIZER INDUSTRY

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Atlanta, Ga.

ANNUAL SUBSCRIPTION RATES

U. S. and its possessions, also Cuba and Panama	$3.00
Canada and Mexico	4.00
Other Foreign Countries	5.00
Single Copy	.25
Back Numbers	.50

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Vol. 101 DECEMBER 2, 1944 No. 11

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What of Government Nitrogen Plants in the Post-War Period?

Ten government-owned nitrogen producing plants, established primarily for making munitions, found time to produce ammonium nitrate for agriculture, and have contributed no little to relieve a temporary agricultural nitrogen shortage in 1943 and 1944. Now that shooting on the war fronts has greatly increased, the Government's synthetic nitrogen plants are almost wholly devoted to the production of explosives, and as a result, agriculture is largely deprived of the use of government-made ammonium nitrate.

Though ammonium nitrate is not new to agriculture, it has received more attention and more general use in recent months than ever before. Discovery of methods of overcoming a tendency to harden and ways of making it granular and workable, has brought ammonium nitrate into a more favorable position.

As a result of these mechanical improvements and the general acceptance of this material, widespread discussion has been started about the use of the ordnance plants for making agricultural nitrogen for the post-war period. It has even been proposed that the Federal Government operate these plants to make agricultural nitrogen.

Those advocating government manufacture of agricultural nitrogen are assuming that it will mean cheaper nitrogen—an assumption based doubtless on wishful thinking rather than on actual cost data.

Prices at which ammonium nitrate have been selling do not indicate that the material will become the one source of cheap agricultural nitrogen for the future. In fact, if all actual and chargeable costs of government-made ammonium nitrate were covered by the price, the cost to the consumer would probably be higher than it is. In fact, when ammonium nitrate from Canadian ordnance plants was released for use in agriculture, no one knew how to price it to the consumer, so it was decided to make the delivery price equal to the delivery price of sulphate of ammonia. Later when domestic production of ordnance plants got under way, prices were raised above the level of delivered sulphate of ammonia, indicating that ammonium nitrate could not be produced and delivered as cheaply as sulphate of ammonia, even when the ammonium nitrate was delivered through tax-free cooperatives.

Government operations are universally

more expensive than private operations. If, therefore, ammonium nitrate is to be produced at lowest cost at ordnance plants, the plants should be privately operated. Only private interests are concerned with cutting costs to meet competition, and competition alone guarantees low cost through efficient production. This is why the Federal Government has sought so enforce competition.

The fertilizer industry is as much interested in obtaining nitrogen at low cost as the farmer. It is therefore in favor of any method of producing nitrogen at lower cost. It should, however, be recognized that it will be of greatest benefit to the consumer, as well as to the fertilizer manufacturer, to keep all sources of nitrogen open and competing. Government interference, either by entering into production or by subsidizing any one form of nitrogen, would, of course, violate the principles of open and fair competition to which the Federal Government is committed by its own legislation.

The Government is in business, as a result of the war. Getting it out of business is up to Congress. Reminding your congressman that it is up to him to fully restore the status of the "American Way of Life" and the operation of free enterprise, is certainly in order.

Plant Food Research Committee Meets

Progress in plant food research and opportunities for further research were discussed at a meeting of the Plant Food Reseach Committee of The National Fertilizer Association, held in Chicago, November 20th. In attendance were: H. B. Siems, chairman; Charles J. Brand (ex-officio member), H. C. Brewer, E. N. Carvel, S. D. Gray, S. B. Haskell, G. N. Hoffer, F. G. Keenen, R. G. Kreiling, M. H. Lockwood, David D. Long, H. R. Smalley, Arthur M. Smith, H. H. Tucker, Dr. James L. Kellog and George H. Sheldon.

The committee concluded that research work initiated by the National Fertilizer Association should be conducted in cooperation with state agricultural experiment stations and the United States Department of Agriculture. As funds are made available, the committee recommended that they be expended on scholarships or as grants of aid, in research on vital problems.

The committee considered that major opportunities for research existed in (1) heavier applications of fertilizers; (2) improvement in diagnostic procedures, including soil and plant analyses and deficiency symptoms; (3) improvement of feed crops through fertilization; (4) fertilizer-cover-crop relationships, and (5) placement.

As head of the sub-committee on heavier applications of fertilizer, G. N. Hoffer stated that lack of response to heavy applications of fertilizer in some instances may be due to lack of soil moisture, but in other cases it is due to lack of soil aeration. He suggested a quick field test to determine soil oxygen. This consists of finding if the iron in the soil is in ferric or ferrous form. If ferric it indicates that the soil contains oxygen; if ferrous, that oxygen is absent.

H. B. Mann, chairman of the sub-committee on fertilizing corn and small grain, reported by mail that Southern States had inaugurated comprehensive fertilizer experiments on corn. Attention was called to the results of heavy application of complete fertilizers in North Carolina by E. M. Hanson who made 107 bushels of corn per acre in 1943 with 120 pounds of nitrogen, 80 pounds P_2O_5 and 80 pounds of K_2O.

S. D. Gray, for the sub-committee on fertilizing fruit trees, reported wide variations of horticulturists' recommendations throughout the country. They have been urged to make larger use of diagnostic procedures including soil analysis, tissue tests and leaf analyses in connection with fertilizer applications.

Research on peanut fertilization, David D. Long reported, had been carried on extensively in the South with varying results, but that a complete report and study of results is now in progress of being made by Southern experiment stations.

Obituary

William E. Wellman

William E. Wellman, well known broker in fertilizer and feed materials in Baltimore, died on November 22nd at the age of 57. Mr. Wellman was connected with the fertilizer industry throughout his business career, starting with the brokerage house of Edward J. Walter Company and later opening his own office. He had a wide circle of friends throughout the industry.

For several years he was president of the Travelers Protective Association and was active in civic and fraternal organizations in his home city.

Proper Nutrient Balance Must be Maintained

By W. R. Paden

Agronomist, Clemson College, S. C.
(Reprinted from "Farm for Victory")

Agronomists recognize that there are many important angles of fundamental research that need attention relative to the utilization of higher rates of nitrogen fertilizers. If efficient use of nitrogen fertilizers is obtained, certain well-established principles of plant nutrition must be used as a guide in their application. One of these principles is that of maintaining in the soil solution the proper physiological balance or ratio of nutrients to each other.

Each element of plant food has a very definite physiological role in the development of plants. If any element is deficient either in quantity or in rate of availability due to unfavorable biological or soil reaction conditions, plants of poor quality and of low yields will result. While it is generally known that a deficiency of nitrogen is shown in scant vegetative growth and premature yellowing of foliage, an excess of nitrogen, relative to other nutrients, causes the plant to continue its vegetative activities for a longer period or fails to produce and mature seed or fruit. Plants vary in their sensitiveness to phosphate starvation. An insufficient supply of phosphate retards grain formation. Potash is a counterpart of nitrogen and is essential for the synthesis of protein. In potash-starved plants the nitrate nitrogen is absorbed, but cannot be assimilated to form protein, and sugars accumulate in the leaf.

Crops vary in their response to fertilizer treatments on different soils. Together with nitrogen, phosphorus and potassium constitute the three major elements of plant food, and all are usually deficient in most southeastern soils. There is a very definite ratio in the amounts of each of these elements required to maintain the proper nutrient balance which varies with the crop in question and the soil conditions under which the crop is to be grown. Fertilizer recommendations are based on results of field plot and greenhouse experiments which have long been used to determine the proper ratio of fertilizer elements best suited for given soil conditions.

Most southeastern soils respond to much higher rates of nitrogen than usually applied as preplanting and as side or top dressing. Since nitrogen is the most costly of the major elements, the tendency has been to apply smaller amounts than would often give highest returns. Where soils have been liberally supplied with mineral elements, phosphorus and potassium, and the rates of nitrogen have been relatively low, it may be possible to produce very profitable yields from much higher rates of nitrogen without correspondingly higher rates of minerals, but this is not sound practice in the efficient use of nitrogen fertilizers.

CCC Asks for Price Supporting Funds

Congress has been asked to appropriate $2,000,000,000 to the Commodity Credit Corporation for its price-support program in 1945. If allowed, this would make $5,000,000,000 available to CCC to use in support of prices of farm crops. This is done by subsidies or purchase of farm commodities which, in turn, gives the organization considerable control over distribution of its controlled commodities.

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FERTILIZER MATERIALS MARKET

NEW YORK

Allocation of Sulphuric Acid Affects Production of Sulphate of Ammonia and Superphosphate. Decrease in Production of these Materials Expected. Potash Deliveries delayed be Transportation Shortage.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, November 28, 1944.

Nitrogen

There has been no change in this situation but with the new ruling which will place sulphuric acid under allocation as of December 1st, it is quite probable that production of sulphate of ammonia may be curtailed somewhat, which will not help the over-all nitrogen picture. The increased demand for munitions is bound to affect supplies of nitrogen available for fertilizer use. There is a possibility that the allocation of inorganic ammonia may be discontinued as of January 1st, but unless this supply situation changes, this is not apt to help.

Superphosphate

Instead of the tremendous increased production which has been mentioned from time to time, it now develops that production of this material for the new fertilizer year will probably be about one million tons less than last year. This production may be further aggravated by the sulphuric acid allocation. Triple superphosphate production may be increased by the opening of a new plant but this new production has not started as yet and deliveries cannot be counted on until material is actually being produced. Increased domestic demands, along with Lend-Lease deliveries, will keep this material extremely scarce, certainly during the first six months of next year.

Potash

Production continues in spite of labor difficulties but several of the larger manufacturers are considerably behind in deliveries due to lack of transportation facilities. There is some indication that allocations may be discontinued after the first of the year and there is buying interest by many fertilizer manufacturers who are ready to take additional potash, provided allocations are discontinued.

Phosphate Rock

Steady demand has continued but it is possible that lack of sulphuric acid may curtail demand, in due time.

BALTIMORE

Labor Shortage and Scarcity of Materials Will Affect Spring Tonnage. More Chilean Nitrate of Soda Promised.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, November 27, 1944.

There has been little change to report on conditions in the fertilizer industry. Shortage of labor and materials will be the determining factors in the coming season's tonnage.

Ammoniates.—All the by-product organics are going practically exclusively to the feeding trades at the current ceiling prices, which are beyond fertilizer range.

Castor Pomace.—Practically no new offerings are on the market. Current contracts are taking entire present output.

Fish Scrap.—No local material available. North Carolina output largely taken by local farmers and for feeding use.

Sulphate of Ammonia.—Deliveries are being made under allocation at ceiling prices. Shortage of sulphuric acid may effect future production.

Nitrate of Soda.—Prices for December are unchanged. Demand continues steady and the report comes that shipping space has been allocated for 850,000 tons of Chilean nitrate by June 30, 1945.

Superphosphate.—The labor situation has prevented producers from taking any new orders. The ceiling price of 65 cents per unit for run-of-pile still prevails.

Potash.—Manufacturers are taking their

Did YOU buy a bond today?
Did YOU give your blood?
Did YOU serve in the war effort?

Remember, tomorrow never comes and if it did it might be too late. Too late to save the lives of thousands of Americans fighting for liberty.

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are fighting for victory on the production lines. In war plants, chemical plants, the fertilizer industry, wherever crushed, powdered or granulated materials are used, these tough, strong, dust-proof, sift-proof, and water-resistant Shipping Sacks are speeding up production and protecting valuable war materials.

THE RAYMOND BAG COMPANY, Middletown, O.

allocations although lack of transportation facilities has prevented some shipments from reaching their destinations on scheduled time.

CHICAGO

Fertilizer Organics in Demand but Short Supply Prevents Sales. Feed Market Reports Some Less-than-Ceiling Sales.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, November 27, 1944.

Active demand for organics continues, although no improvement in offerings is noticeable. The only western fertilizer ingredient in which some trading has taken place is steamed bone meal—at sellers' full ceiling prices.

In the feed trade there is slightly easier demand for wet and dry rendered tankage, and a few sales have been made at somewhat lower than ceiling, though most of these sales were for second-grade qualities.

Ceiling prices are:

High grade ground fertilizer tankage, $3.85 to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.53 ($6.72 per unit N); dry rendered tankage, $1.25 per unit of protein, f. o. b. producing points.

CHARLESTON

Shortages Develop in Many Materials. Allocations May be Lifted from Potash. Nitrate of Soda Lost in Warehouse Fire.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, November 27, 1944.

Organics.—Tight situation on this continues as nothing is being offered.

Potash.—There have been continued rumors that the WPB is considering ending restrictions on this material the first of January, but this is not definitely in sight and it would seem that some form of allocation to the manufacturers will have to be continued..

Nitrogen.—A similar report has also been rumored as regards nitrogen, but most authorities doubt that this will really happen.

Sulphate of Ammonia.—On account of the shortage of ammonium nitrate, apparently the entire production of ammonium sulphate up to June, 1945, has now been allocated.

Nitrate of Soda.—The Ship-Yard River Terminal, Charleston, South Carolina, has just sustained a very heavy fire loss, in which plant was stored a considerable quantity of Chilean nitrate of soda.

Superphosphate.—It is now generally estimated that the production of superphosphate, based on 18 per cent A. P. A., will probably be over a million tons less in 1944 than in 1943.

TENNESSEE PHOSPHATE

Manpower Handicaps Phosphate Production for All Lines of Consuming Trade.

Exclusive Correspondence to "The American Fertilizer"

COLUMBIA, TENN., November 27, 1944.

Labor or manpower shortage is still the enormous obstacle to getting things done in all lines of endeavor here, from farming to bagging and loading phosphate for the thousands of farmers who are crying for it and who cannot be blamed when it is realized that in the corn belt States every ton these farmers can spread before December 31st will earn them from $11.00 to $13.00.

Inquiry and orders from all consuming channels seem to be more active and all plants are operating at full speed, but still limited to about two-thirds capacity by labor shortage and inefficiency of those left in comparison with the usual labor mostly drawn off for war plant work and selective service boards.

The Chairman of the Governor's Committee appointed to make recommendation

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for legislation at the approaching session of the Assembly, looking to compulsory restoration of the mined-over lands for agricultural use, called the operators together at Mt. pleasant on November 23rd and asked their views as to cooperation with the State forces in this effort, without any legislation being necessary. It is not believed that this vexing question will be precipitated in any compulsory laws, as everyone believes that the plan of voluntary cooperation on both sides will lead to far better results.

Farmer's Union Backs Hill Bill

President James G. Patton of the National Farmer's Union has written all members of Congress asking their support of the bill of Senator Lister B. Hill, Alabama, which proposes a national fertilizer policy program. He claims that the war has provided Congress the opportunity of assuring the American farmer abundant, low cost fertilizers. In brief he proposes for the guidance of Congress the following:

Potash

Production of potash from public lands owned by the whole people should not result in private profit. At a minimum, potash produced from public land in New Mexico and California should be made available to farmers at cost either through publicly conducted operations or through negotiation of leases with farmer cooperatives. Moreover, Geological Survey investigations which resulted in location of present potash reserves should be stepped up in Utah and other states to locate additional sources.

Nitrogen

The nine synthetic ammonia plants built by the government should be made into "yardstick" plants, on the TVA principle, for the production of fertilizer nitrogen. Some should be retained in government ownership and operation for possible future military needs, but meanwhile they should be operated to the benefit of farmers. The others should be turned over to farmer cooperatives for their operation under government supervision.

Superphosphates

A three-point superphosphate program is needed: (a) A program for government production of sulphuric acid in peacetime should be developed now with a view to continuing and expanding the output now developed as a by-product of explosive and other war plants, since the production of sulphuric acid is the limiting factor in the national production of superphosphates; (b) all power and resource development legislation in future should carry specific legislative provision for TVA-type phosphate production and use, including provision for electric furnaces for fertilizer manufacture; (c) Western phosphate sources should be developed now through loans to farmer cooperatives, so that the South may not be forced to depend on other sections through premature exhaustion of its deposits.

Mixing Plants

Establishment of a revolving fund of, say, $100,000,000 for loans to cooperatives for small fertilizer plants in every state, and even for several in some States, should be authorized by Congress. Present haphazard practices of shipping some elements of mixed fertilizer far across the country,

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A shortage of the necessary cotton cloth is, of course, a bottleneck. So, to supplement our usual close cooperation with the cotton industry, we took an unusual step —

An advertisement, appearing in the leading cotton textile newspaper, told the cotton merchants (1) about the amazing growth of the essential fertilizer industry, (2) the need for bags for fertilizer and (3) the types of cotton goods particularly needed.

The whole object of this unusual undertaking is to create a closer cooperation between the cotton textile and the bag industries . . . *to give you greater assurance of the supply of bags you need.*

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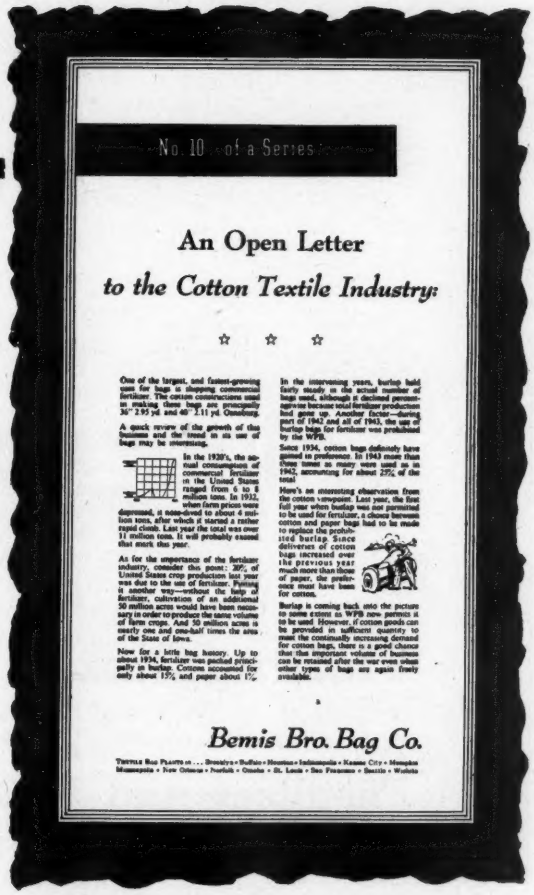

No. 10 of a Series

An Open Letter
to the Cotton Textile Industry:

☆ ☆ ☆

One of the largest, and fastest-growing uses for bags is shopping commercial fertilizer. The cotton constructions used in making these bags are principally 36" 2.95 yd. and 40" 2.11 yd. Osnaburg.

A quick review of the growth of the business and the trend in its use of bags may be reverting.

In the 1920's, the annual consumption of commercial fertilizer in the United States ranged from 6 to 8 million tons. In 1932, when farm prices were depressed, it nose-dived to about 4 million tons, after which it started a rather rapid climb. Last year the total was over 11 million tons. It will probably exceed that mark this year.

As for the importance of the fertilizer industry, consider this point: 30% of United States crop production last year was due to the use of fertilizer. Putting it another way—without the help of fertilizer, cultivation of an additional 50 million acres would have been necessary in order to produce the same volume of farm crops. And 50 million acres is nearly one and one-half times the area of the State of Iowa.

Now for a little bag history. Up to about 1934, fertilizer was packed principally in burlap. Cottons accounted for only about 15%, and paper about 1%.

In the intervening years, burlap held fairly steady at the actual number of bags used, although it declined percentagewise because total fertilizer production had gone up. Another factor—during part of 1942 and all of 1943, the use of burlap bags for fertilizer was prohibited by the WPB.

Since 1934, cotton bags definitely have gained in preference. In 1943 more than three times as many were used as in 1942, accounting for about 25% of the total.

Here's an interesting observation from the cotton viewpoint. Last year, the first full year when burlap was not permitted to be used for fertilizer, a choice between cotton and paper bags had to be made to replace the prohibited burlap. Since deliveries of cotton bags increased over the previous year much more than those of paper, the preference must have been for cotton.

Burlap is coming back into the picture to some extent as WPB now permits it to be used. However, if cotton goods can be provided in sufficient quantity to meet the constantly increasing demand for cotton bags, there is a good chance that this important volume of business can be retained after the war even when other types of bags are again freely available.

Bemis Bro. Bag Co.

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This is a greatly reduced reproduction of the advertisement to the cotton textile industry, telling how cotton goods are required for bags for fertilizer. Copy will be sent you on request.

East Pepperell, Mass.

and then shipping them back as parts of mixed fertilizer, are absurd and have no economic reason.

Plant Food Content

Congress should enact legislation calling for Federal-State cooperation to eliminate as much "filler" as practicable from mixed fertilizer, to the end that farmers may receive more for their money, freight charges be cut, and food purchasers receive maximum nutritional value for their money.

California Association Opposes Lemke and Hill Bills

Resolutions adopted by the California Fertilizer Association at its recent annual meeting opposes the Lemke Bill (H. R. 4806) and the Hill Bill (S. 2035) and urge senators and representatives of California to put forth every reasonable effort to bring about their defeat.

Concerning the Lemke Bill, the association declared:

That the bill's requirement of a guarantee of the amount and source of each material and analysis of each material used in each 100 pounds of mixed fertilizer, is impractical of application;

That fertilizer-consuming states already have effective laws covering registration, manufacture, labeling and inspection of fertilizers and fertilizer materials;

That the proposed inspection fee of 50 cents a ton is unreasonable and would increase the cost of fertilizers to the farmer.

The resolution dealing with the Hill Bill declares opposition to allowing TVA to form a fertilizer policy and program which it declared can be explained only as a political expedient;

That fertilizer manufacturers have long done an excellent job of supplying the fertilizer needs of agriculture at a reasonable cost, the lowest among his supplies;

That the fertilizer industry has not depreciated the quality of fertilizers, or wasted the mineral resources of the nation, or fallen short of the agricultural demand for plant food;

That there are privately owned superphosphate plants with sufficient capacity to more than supply the normal agricultural requirements for superphosphates;

That the government should not engage in business in competition with private industry and attempt to regiment and socialize private industry.

Merry Christmas

Hollingshurst & Co., Inc.

A. Berger, President

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INDUSTRY ADVISORY COMMITTEE

(Continued from page 10)

resumption, or initiation of production for non-war use, any restriction on the use of materials must make provision for business newcomers. for small plants, and for service men. These requirements, he indicated, might make allocation of materials on an historical use basis practically impossible from a practical and administrative point of view.

It is understood that a decision on the question of nitrogen controls will be announced in the not too distant future.

Early Movement of Fertilizers

The subcommittee on mixed fertilizers recommended that the publicity campaign now being conducted by government agencies and the industry should be continued, except on the West Coast where early movement is not essential. The committee discussion developed the fact that in many areas progress in the shipping and delivery of fertilizer is not as good as last year. There is reluctance on the part of farmers to accept delivery early. The thought was expressed that conditions, especially as to labor, make early delivery perhaps even more important than it was last year. Members of the committee felt that intensive efforts should be made, through all possible channels, to get farmers in affected areas to take delivery immediately. In this connection it was suggested that publicity material as to overall supplies of fertilizer available for 1944-45 should be modified to conform to changed conditions in the connection with superphosphate and nitrogen supplies.

Labor

WFA reported, on the basis of a survey, that labor conditions in the fertilizer industry continue acute, particularly in some areas. Some plants have been getting some off-season farm labor. The use of women, except for clerical work, is not generally feasible. The use of Jamaicans, of whom there are about 4,500 in the eastern part of the country was suggested. It was pointed out in this connection that there are certain government requirements that must be met; that in some places labor unions object to the use of Jamaicans; and that housing and transportation problems are involved. One manufacturer reported that he had used a number of Jamaicans, with satisfactory results. Any one desiring detailed information on this matter may apply to his local USES office or write to Mr. A. G. Taylor, Office of Labor, War Food Administration, Washington 25, D. C.

Maximum Prices

Mr. Gran stated that he does not expect maximum prices of all commodities to be removed at the same time, but that such prices will be lifted from various commodities as conditions warrant. The removal or non-removal of controls by other agencies does not affect OPA action in this respect. He has recommended that maximum prices for fertilizers be lifted June 30, 1945, if supplies and the labor situation at that time warrant.

It is expected that within a week or ten days some minor amendments to Second Revised Maximum Price Regulation 135 will be issued. These amendments are largely for purposes of clarification and the need for them became apparent principally as a result of visits of OPA Washington officials to OPA regional offices for the purpose of discussing the regulation.

Next Meeting

It is presently planned to hold the next meeting of the committee on Wednesday, March 7, 1945, with subcommittee meetings on the 6th.

Potash Deliveries Continue To Increase

A total of 375,574 short tons of potash salts containing an equivalent of 205,235 tons K_2O was delivered in the United States, Canada, Cuba, Puerto Rico and Hawaii during the third quarter of 1944 by the five major American producing companies, according to data released by the American

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Dependable for more than 50 Years
All-Steel Self-Contained Fertilizer Mixing Units
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*REG. U. S. PAT. OFF.

Potash Institute. This was an increase of 8.9 per cent in salts and 16.7 per cent in K_2O compared to the same period in 1943. Deliveries for agricultural use amounted to 342,349 tons of salts, equivalent to 184,501 tons K_2O made up of 265,895 tons of muriate of potash, 36,019 tons of manure salts, and 40,435 tons of sulphate of potash and sulphate of potash-magnesia. The chemical industry took 33,225 tons of muriate of potash and sulphate of potash, equivalent to 20,734 tons K_2O.

During the first nine months of 1944, total deliveries amounted to 1,122,481 tons of salts, containing an equivalent of 594,525 tons K_2O. These were an increase of 12.6 per cent in salts and 14.7 per cent in K_2O over the same period in 1943. Potash for agricultural use totaled 1,023,094 tons of salts, with an equivalent of 532,532 tons K_2O, representing increases of 13.4 per cent in salts and 16.3 per cent in K_2O. There were 750,184 tons of muriate of potash, 164,299 tons of manure salts, and 108,611 tons of sulphate of potash and sulphate of potash-magnesia making up the agricultural salts. Deliveries for chemical uses amounted to 99,387 tons of muriate of potash and sulphate of potash, with an equivalent of 61,993 tons K_2O, representing increases of 5.3 per cent in salts and 2.6 per cent in K_2O over the same period last year.

POTASH DELIVERIES
Short Tons K_2O
(United States, Canada, Cuba, Hawaii, Puerto Rico)

	Jan.-Sept. 1944	Jan.-Sept. 1943
Muriate	450,482	384,372
Manure Salts	40,989	36,184
Sulphate and Sul. Pot. Mag.	41,061	37,442
Total Agricultural	532,532	457,998
Chemical	61,993	60,409
Grand Total	594,525	518,407

The One-One-One Fertilizer Ratio

By Firman E. Bear*

Some forty years ago it was pointed out that plant food ratios in mixed fertilizers are greatly influenced by the relative abundance of the several materials that go into the making of such mixtures. Thus the phosphoric acid content of fertilizers in the United States has been relatively high because of the abundance of our phosphate deposits. Similarly, the farmers of Continental Europe have used relatively large amounts of potash fertilizers because of their proximity to the Stassfurt salt deposits.

As a result of the current war, we now have an enormous capacity to produce nitrogen fertilizer materials and we have become quite independent of Europe for potash salts. Once the war is over, foreign producers of nitrogen and potash materials will renew their bid for American business. This means that fertilizer analyses will tend to change in the direction of relatively more nitrogen and potash and less phosphoric acid.

There are other good reasons for believing this change will be effected. The substitution of the tractor and automobile for the horse has greatly reduced the amount of manure that is available for use, and manure is essentially a nitrogen-potash fertilizer. The selling prices of nitrogen and potash, in relation to that of phosphoric acid, have been greatly reduced. The virgin fertility of the soil, which was more largely based on its content of available nitrogen and potash than on its available phosphoric acid, no longer exists.

*Soil Chemist, New Jersey Experiment Station, reprinted from "Farm for Victory," issued by Chilean Nitrate Educational Bureau.

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Agricultural authorities have shown that a lack of Boron in the soil can result in deficiency diseases which seriously impair the yield and quality of crops.

When Boron deficiencies are found, follow the recommendations of local County Agents or State Experiment Stations.

Information and references available on request.

AMERICAN POTASH & CHEMICAL CORPORATION
122 East 42nd ST., NEW YORK CITY
Pioneer Producers of Muriate of Potash in America

See Page 4

The heavy consumption of phosphate fertilizers on intensively cultivated land has tended toward an accumulation of phosphoric acid in the soils of those areas. And, finally, sales pressure for nitrogen and potash will grow in proportion to the increase in the supplies of materials containing them.

Some thirty years ago the tendency was quite different. Then the pressure of the surplus of superphosphate was such that a campaign for high-analysis fertilizers was organized to raise the 2–8–2 to the 2–12–2 and the 4–8–4 to the 4–16–4, merely as a means of disposing of more superphosphate. The program was put across, and not without benefit to all concerned. Later, increasing supplies of potash salts tended to change the 4–8–4 and the 5–10–5 to the 4–8–8 and 5–10–10, respectively. Soon increased pressure will be applied to nitrogen with the result that production will center on such grades as the 7–7–7 and 10–10–10, the choice depending upon whether the farmer favors low-analysis or high-analysis mixtures.

It seems probable that, for most purposes, such a change in plant food ratios will be desirable. In the Corn Belt, the fertilizer will probably be applied broadcast and plowed under, save for a small quantity applied along the row as a starter. In the more intensive farming sections of the humid areas, the tendency will probably be in the direction of dividing the mixed-fertilizer application into several doses, applying part over the soil in advance of plowing, part along the row at planting time, and part as a side dressing or top dressing, the frequency of the latter applications being determined by the sandiness of the soil and the increase in the development of irrigation farming.

It would seem advisable for every farseeing fertilizer mixer to formulate at least one grade of fertilizer with a 1–1–1 plant food ratio. Unless all signs change, the tonnage of this ratio is destined to assume very large proportions in the relatively near future. The 7–7–7 or some similar grade will fill an especially important place in grassland agriculture, a type of farming that will take on greatly increased importance after the war is won.

Fertilizing To Increase the Yield and Longevity of Alfalfa in Georgia

By L. C. Olson, *Associate Agronomist*

Alfalfa, at the present, is grown only to a limited extent in Georgia. While the need for good hay is acute, the number of failures in attempts to grow alfalfa has discouraged many farmers from planting this crop. In some sections the difficulty encountered is the failure to maintain a stand of alfalfa more than two years after seeding. The high cost of seeding, fertilizing, and land preparation makes it uneconomical to grow alfalfa, if a good stand cannot be maintained for a longer period than two years.

Fertilizer tests conducted by the Georgia Experiment Station during 1942 and 1943 indicate that the lack of potash is one of the principal reasons why alfalfa stands cannot be maintained. On a test in De Kalb County, an annual application of 100 and 200 pounds of muriate of potash per acre not only maintained an excellent stand but also greatly increased the yield. Plots that did not receive potash died out the first year after seeding. In Spalding County on a field of old alfalfa, which was rapidly dying out, a top-dressing of muriate of potash rejuvenated the stand and also increased the yield. On both tests, applications of borax at the rates of 10 and 20 pounds per acre were of benefit only when high rates of potash were used.

On the basis of the recent tests and older tests conducted with alfalfa by this Station, the following recommendations are made:

Broadcast ground limestone at the rate of approximately two tons per acre several months before seeding. About 10 to 20 tons of barnyard manure should be used. Sixteen to twenty per cent superphosphate at the rate of 500 to 600 pounds per acre should be applied at about the same time or a little later. After a thorough seedbed preparation, drill in 20 to 30 pounds per acre of Kansas Common seed which has been inoculated. A cultipacker or a roller of some kind is a useful implement to firm the seedbed before and

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But the current death rate shows that the battle is *far from won* — that your dollars are needed now, urgently.

Please, send in your contribution today.

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The National, State and Local Tuberculosis Associations in the United States

after planting. An early October seeding is thought best at the present. In February top-dress the alfalfa with 150 pounds muriate of potash and 10 pounds borax. Repeat this top-dressing annually. The applications of phosphate and limestone probably should be repeated in three or four years, using about one-half of the initial applications.

If the fall seeding is a failure due to dry weather or other causes, the land should be reseeded in late February or early March.

Bags That Can Take It

The war brought a need for containers with protective qualities far superior to anything hitherto available. Supplies must reach the fighting fronts in usable condition. The experience in the early months of the war proved that many packages then in use were unable to withstand the grueling conditions of actual warfare. Vast quantities of supplies, rendered useless by improper packaging, were piled high on foreign shores. Drastic revisions of packaging specifications for supplies going to our overseas troops were made immediately by military authorities.

One type of container that stood up well, probably because of its flexibility, was the multiwall paper bag, but there was a need for a still better bag. This need resulted in the development of some remarkable new types of bags. Multiwall paper bags are now being made to withstand conditions that in prewar days would have been considered impossible.

One of the bags developed is waterproof and has great sturdiness and extreme resistance to moisture-vapor penetration. However, no bag is better than its closure. While multiwall paper bags could be made that were adequate in strength and with sufficient waterproofing qualities, there was no bag closing method which would give the needed protection to the contents.

Bemis Bro. Bag Company developed a closure for the purpose called the "Aquatex Closure" which has a remarkable record of performance. This consists of a tape made of starched crinoline laminated to double-napped flannel. The tape is sewn on the bottom of the bag when it is manufactured and then dipped in a special wax. The wax penetrates the crinoline and is absorbed by the flannel and the sewing thread. It is thus diffused between the plies of the paper in the bag, forming a ply-by-ply waterproof closure. The same method is used to close the top of the bag after it has been filled at the user's plant.

Multiwall bags with the Aquatex Closure proved so successful that one of the large manufacturers of chemicals conducted a severe test under actual working conditions to see how these bags and the Aquatex Closure would hold up over long periods of out-of-door storage. A carload of bags, packed with a water-soluble salt, was shipped by rail to a plant about 350 miles away. The trip necessitated several transfers, including a movement by car float, which subjected the bags to much rough handling. On December 15, 1943, the car arrived at its destination. The bags were stacked on a platform out-of-doors. Bags have been taken from this stock for regular use in the manufacturer's plant. The contents of every bag used so far have been found to be in perfect condition. If water had penetrated to the inside of the bags, the contents would have dissolved.

On May 2, 1944, after nearly five months of outdoor storage, bags taken from this lot were tested before a group of over thirty members of the Manufacturing Chemists Association. The tests consisted of dropping the bags from a height of five feet on each butt, then on each edge, then on each face, and finally on each face over a 8 by 4-inch wooden block. The bags were opened immediately after the tests and the contents were found to be 100 per cent clean and dry. Some of the bags are still stored out-of-doors. Snow, sleet, rain, sun and all the rigorous conditions of the New England winter climate failed to affect the bags and their contents.

The development of this bag and the Aquatex Closure is one of those achievements resulting from war necessity which will carry over into peacetime as a real contribution to the better packaging of chemicals.

BUYERS' GUIDE • A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

This list contains representative concerns in the Commercial Fertilizer Industry, including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

AMMONIA—Anhydrous and Liquor
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.
Nitrogen Products, Inc., New York City

AMMONIUM NITRATE SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

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Fulton Bag & Cotton Mills, Atlanta, Ga.
Mente & Co., Inc., New Orleans, La.

BAG MANUFACTURERS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Fulton Bag & Cotton Mills, Atlanta, Ga.
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Fulton Bag & Cotton Mills, Atlanta, Ga.
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St. Regis Paper Co., New York City.

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American Potash and Chem. Corp., New York City.

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Utility Works, The, East Point, Ga.

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Utility Works, The, East Point, Ga.

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Schmaltz, Jos. H., Chicago, Ill.
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U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

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International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

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UREA-AMMONIA LIQUOR
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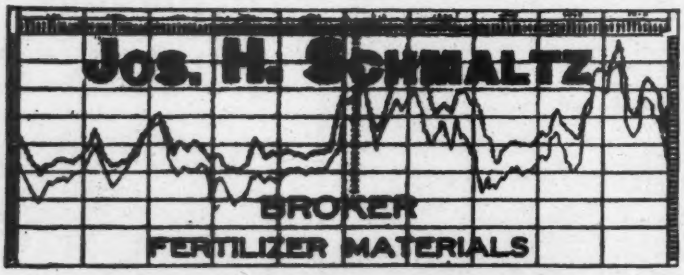

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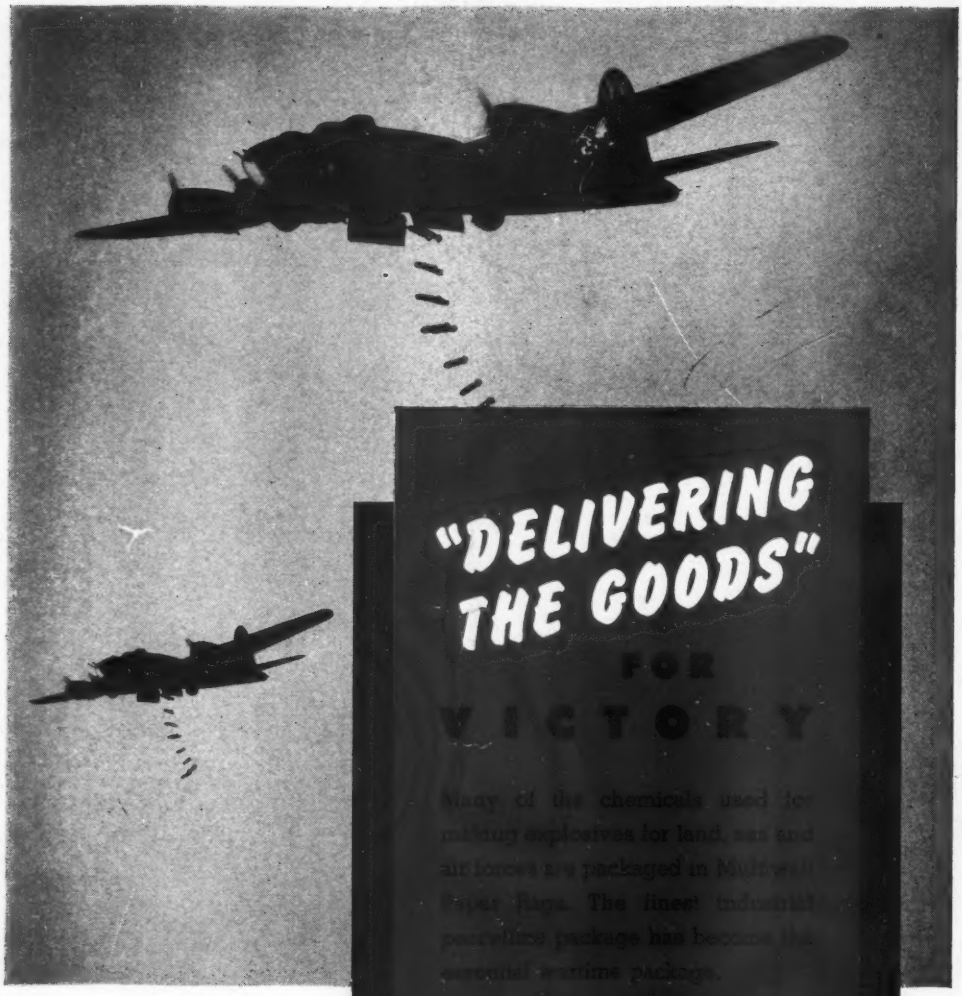

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